REMARKS

I. **Introduction**

In response to the Office Action dated August 21, 2002, claims 2, 12 and 22 have been cancelled, and claims 1, 3, 11, 13, 21 and 23 have been amended. Claims 1, 3-11, 13-21 and 23-30 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. **Prior Art Rejections**

A. **The Office Action Rejections**

In paragraphs (2)-(3) of the Office Action, claims 1-5, 11-15, and 21-25 were rejected under 35 U.S.C. §102(b) as being anticipated by Schiefer et al., U.S. Patent No. 5,761,653 (Schiefer). In paragraphs (4)-(5) of the Office Action, claims 6-10, 16-20, and 26-30 were rejected under 35 U.S.C. §103(a) as being unpatentable over Schiefer in view of Raitto et al., U.S. Patent No. 5,991,754 (Raitto).

Applicant's attorney respectfully traverses these rejections.

B. **The Applicant's Claimed Invention**

Applicant's claimed invention, as recited in independent claims 1, 11, and 21, is generally directed to a method of optimizing execution of a query that accesses data stored on a data store connected to a computer. Claim 1 is representative and recites the steps of generating cardinality estimates for one or more query execution plans for the query using statistics of one or more automatic summary tables that vertically overlap the query, and using the generated cardinality estimates to determine an optimal query execution plan for the query.

C. **The Schiefer Reference**

Schiefer describes a method for estimating cardinalities for query processing in a relational database management system. The method is suitable for use with a query optimizer for estimating cardinalities for sets of columns or keys resulting from a grouping operation or a duplicate removal operation.

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D.   The Raitto Reference

Raitto describes a method and system for processing queries, where the queries do not reference a particular materialized view. Specifically, techniques are provided for handling a query that specifies a first set of one or more aggregate functions, where the particular materialized view reflects a second set of one or more aggregate functions. Whether the query can be rewritten is determined based on the aggregate functions in the first and second sets, and the corresponding arguments. Techniques are also provided for processing a query that (1) does not reference a particular materialized view, (2) specifies a first set of one or more aggregate functions, where the particular materialized view reflects a second set of one or more aggregate functions. A technique is also provided for rewriting queries that specify an outer join that has a dimension table on the child-side of the outer join and a fact table on the parent-side of the outer join. The query is rewritten to produce a rewritten query by replacing references to the fact table in the query with references to a materialized view. The rewritten query specifies an outer join that has the dimension table on the child side and the materialized view on the parent side.

E.   Applicant's Claimed Invention Is Patentable Over The Cited References

Applicant's claimed invention is patentable over Schiefer and Raitto, because it includes a combination of limitations not taught or suggested by the cited references, taken individually or in combination. Specifically, neither reference teaches or suggests the amended independent claims that recite the steps or elements comprising "generating cardinality estimates for one or more query execution plans for the query using statistics of one or more automatic summary tables that vertically overlap the query," and "using the cardinality estimates to determine an optimal query execution plan for the query."

Schiefer is cited by the Office Action as teaching all of the steps or elements of the independent claims 1, 11 and 21, as well as the step or element of dependent claims 2, 12 and 22, now incorporated into the independent claims.

Applicant's attorney disagrees.

For example, the Office Action states that the element of claim 2, 12 and 22 regarding generating cardinality estimates, can be found at col. 7, lines 21-30 of Schiefer. However, at the indicated location, Schiefer merely states the following:

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<u>Schiefer, Col. 7, lines 21-30</u>

The first st p in Line 1 of the present method involves inputting the key K comprising columns C in the resulting table T. The columns C comprising the key K are the result of a grouping operation or duplicate removal operation, for example, the "GROUP BY" clause or "DISTINCT" clause in the SQL query language. The present method will produce an estimate for the cardinality of the key K, i.e. key cardinality, for the columns C in the resulting table. The estimated key cardinality is used by the query optimizer 18 (FIG. 1) to generate a query execution plan as will be understood by one skilled in the art.

Nothing in the above description can fairly be said to represent "generating cardinality estimates for one or more query execution plans for the query using statistics of one or more automatic summary tables that vertically overlap the query." Recall, from Applicant's specification, that automatic summary tables are pre-computed queries and an automatic summary table vertically overlaps a query when the set of predicates applied by the automatic summary table is a subset of the predicates required by the query. Schiefer does not refer to "automatic summary tables" (or "materialized views"), and therefore does not need to determine that the automatic summary tables vertically overlap the query.

Raitto does not overcome the deficiencies of Schiefer. Recall that Raitto was cited only against dependent claims 6-10, 16-20 and 26-30, and is specifically directed to queries that do not reference a particular materialized view (automatic summary table).

Consequently, even when combined, the Schiefer and Raitto references teach away from Applicant's invention. Moreover, the various elements of Applicant's claimed invention together provide operational advantages over the cited references. In addition, Applicant's invention solves problems not recognized by the cited references.

Thus, Applicant submits that independent claims 1, 11 and 21 are allowable over Schiefer and Raitto. Further, dependent claims 3-10, 13-20 and 23-30 are submitted to be allowable over Schiefer and Raitto in the same manner, because they are dependent on independent claims 1, 11 and 21, respectively, and because they contain all the limitations of the independent claims. In addition, dependent claims 3-10, 13-20 and 23-30 recite additional novel elements not shown by Schiefer and Raitto.

III.   <u>Conclusion</u>

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that
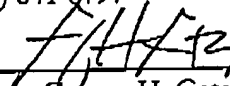
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can be resolved in a telephone interview, the Examiner is urged to call Applicant's undersigned attorney.

Respectfully submitted,

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APPENDIX: CLAIMS IN MARKED-UP FORM

1. (AMENDED) A method of optimizing execution of a query that accesses data stored on a data store connected to a computer, comprising:

generating cardinality estimates for one or more query execution plans for the query using statistics of one or more automatic summary tables that vertically overlap the query; and

using [statistics on one or more automatic summary tables] the generated cardinality estimates to determine an optimal query execution plan for the query.

3. (AMENDED) The method of claim [2] 1, wherein the statistics of the one or more automatic summary tables are used to improve a combined selectivity estimate of one or more predicates of the query.

11. (AMENDED) An apparatus for optimizing execution of a query, comprising:

a computer having a data store coupled thereto, wherein the data store stores data;

one or more computer programs, performed by the computer, for generating cardinality estimates for one or more query execution plans for the query using statistics of one or more automatic summary tables that vertically overlap the query, and for using [statistics on one or more automatic summary tables] the generated cardinality estimates to determine an optimal query execution plan for the query.

13. (AMENDED) The apparatus of claim [12] 11, wherein the statistics of the one or more automatic summary tables are used to improve a combined selectivity estimate of one or more predicates of the query.

21. (AMENDED) An article of manufacture comprising a program storage medium readable by a computer and embodying one or more instructions executable by the computer to optimizing execution of a query that accesses data stored on a data store connected to the computer, comprising:

generating cardinality estimates for one or more query execution plans for the query using statistics of one or more automatic summary tables that vertically overlap the query; and

using [statistics on one or more automatic summary tables] the generated cardinality estimates to determine an optimal query execution plan for the query.

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23. (AMENDED) The article of manufacture of claim [22] 21, wherein the statistics of the one or more automatic summary tables are used to improve a combined selectivity estimate of one or more predicates of the query.

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